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Policy Review of Solution Gas Flaring and Conservation in Alberta

June 1997

Alberta Energy and Utilities Board

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ALBERTA ENERGY AND UTILITIES BOARD

POLICY REVIEW OF SOLUTION GAS FLARING AND CONSERVATION IN ALBERTA

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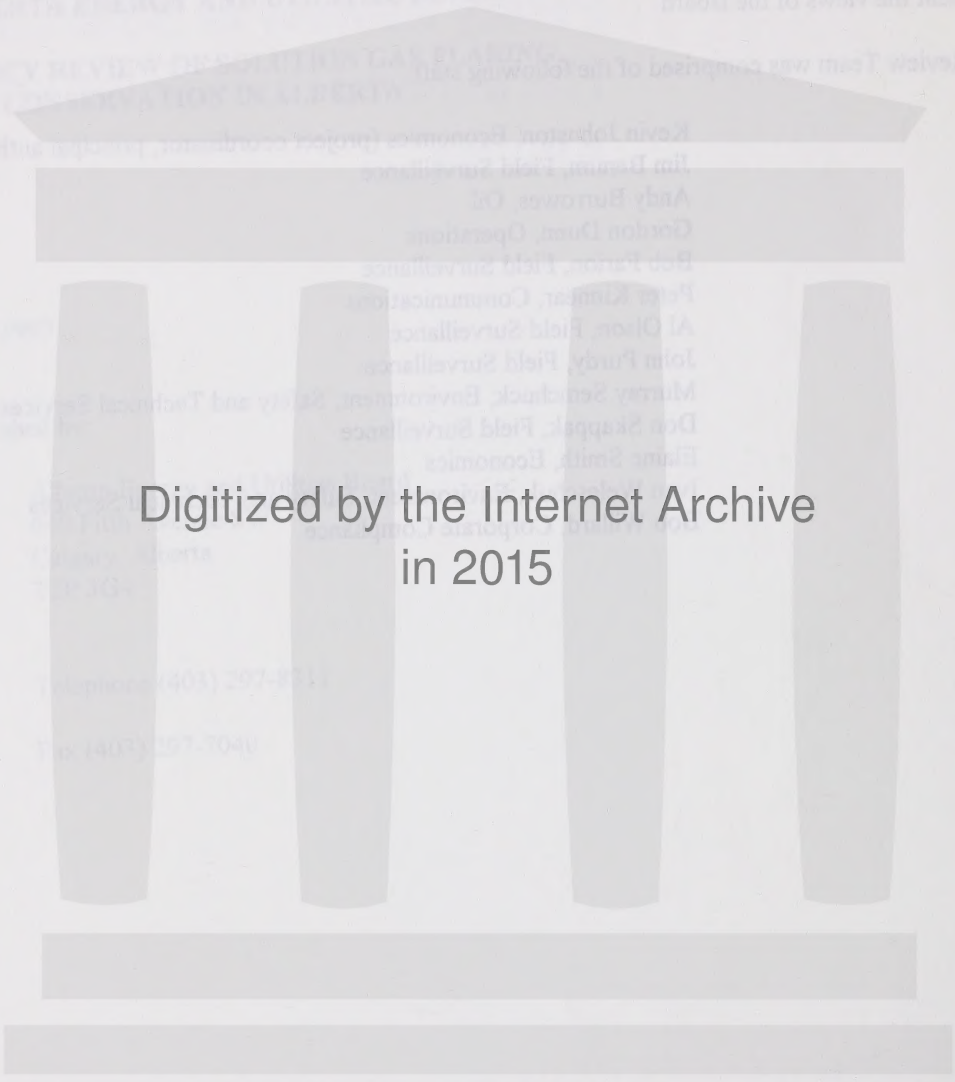

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Appendices

Appendix A - Further Solution Gas Conservation in Alberta

Appendix B - Sample Information Package

Policy Review of Solution Gas Flaring and Conservation in Alberta

Executive Summary

Context

In early 1996 the Alberta Energy and Utilities (EUB) initiated a review of its regulation of the long-standing industry practice of flaring waste solution gas at oil production facilities (batteries). Historically the EUB sought to eliminate the waste of natural gas wherever possible in an effort to maximize the utilization of this non-renewable resource. Economic and regulatory forces have combined over time with the result that 92 per cent of the solution gas produced in Alberta is captured and marketed. The remaining 8 per cent is treated as a waste product and disposed of by combustion in a flare.

Over time, the regulatory issue associated with solution gas has increasingly emphasized air quality over resource conservation, although the latter continues to play an important role in the EUB's regulatory process. Air quality regulation, with respect to oil and gas industry activities, is a shared responsibility with Alberta Environmental Protection (AEP). In general, air quality effects associated with solution gas flaring are well within current acceptable limits. Notwithstanding this, in areas of the province where numerous flares are operating, there is considerable public concern about air quality impacts, the possible effects of pollutants on human and animal health, and general environmental quality. The EUB Field Centres receive many public complaints about flaring. Most of these stem from concerns about odours and possible health effects from emissions associated with flaring. In active oilfield development areas, where gas conservation lags field development, public concern about flaring may lead to emotional confrontations between landowners and the oil industry. The EUB is often called upon as an intermediary in such disputes.

Repeated situations of this nature have prompted the EUB to re-examine the need to apply further measures to reduce public concern about flaring. A policy review team was created in early 1996 to examine ways of dealing with this issue. In April 1996 the EUB released Informational Letter (IL) 96-6 which set the stage for this review. The IL identified the need to consult with public and industry to ensure that the EUB had a full awareness of all perspectives on the issue. Members of the Review Team met with public/industry groups at three locations (Red Deer, Taber, and Hardisty) in June 1996, these being areas of active solution gas flaring in Alberta. Background information was circulated in advance of the meetings, consisting of EUB data on oil and gas activity in the province and in the immediate areas of the focus groups, to help put the issue in perspective. (A sample information package, which was sent to the Taber participants, is attached as Appendix A.) Participants were advised that their input would provide the basis for the Review Team's subsequent analysis of the existing policies and recommendations for change, where change was warranted. Participants were further advised that their comments on the

Review Team's report would be included in the finalized version that would be forwarded to the EUB (attached as Appendix B).

Results of Consultation Process

The participants' views can be categorized generally under three major headings: concerns, needs, and recommendations. While there were two distinct mainstreams of thought around some of the issues, depending on the participant's industry/non-industry affiliation, there was also close agreement by all participants on many other issues .

Non-industry representatives in the meetings were most concerned about the potential impacts of flaring on personal and livestock health, local and global environmental degradation, and waste of non-renewable resources. They voiced the needs for better scientific information on the health and environmental effects of emissions from flares, as well as improved communications channels between industry, regulators and the public. They wanted to be better informed on the regulatory framework, to gain a better appreciation for the technological side of flaring and its alternatives, and to understand the economic tradeoffs involved. The range of ideas for policy direction was wide with no suggestion that existing policies ought to be relaxed. There was strong support for encouraging technological developments and information dissemination wherever these might result in reductions in flaring. As well, there was good support for investigating various regulatory instruments as a means of reducing flaring, such as royalty incentives for those who tie-in gas that otherwise would have been flared, attaching a royalty to gas that is flared, and reviewing the manner in which gas plant processing fees are established. Although it was not discussed extensively, there was some support for the idea of "buffer zones" wherein flaring would be contained or reduced, depending on factors such as proximity to residents, the type and volumes of gas being flared and other relevant local criteria. For some, nothing short of a complete elimination of flaring would suffice, with the recommendation that a timetable be drawn up accordingly.

Industry representatives were equally concerned about a lack of scientific evidence on the impacts of flaring on the environment, and they agreed that further research is necessary. Their immediate policy advice, however, was to avoid imposing tremendous costs on the industry that are not likely to be justifiable. They agreed that additional efforts are needed to improve communications between industry, regulators and the public, suggesting that such efforts could improve the public's confidence in industry's practices and help to put the issues in a proper perspective. Industry representatives were also concerned about uneven and arbitrary regulatory practices, and the royalty implications of regulatory requirements to tie-in unprofitable gas volumes.

Review Team's Views

The Review Team believes there are three distinct groups of concerns with respect to solution gas flaring: local health/environmental impacts, waste of nonrenewable resources (resource conservation), and potential global environmental impacts. After considering the EUB's legislated

responsibilities the Review Team believes that the EUB has a clear mandate to regulate industry activities in two of these areas: resource conservation and potential local health/environmental impacts. With respect to these two major areas of responsibility the Review Team offers the following views:

1. The EUB's flaring policies were developed at a time when it was believed that flaring combustion efficiencies were higher than has recently been shown to be the case. In view of a recently published study by the Alberta Research Council, "Investigations of Flare Gas Emissions in Alberta", the Review Team believes that industry should pursue technology areas identified in that study. The Review Team further believes that the EUB should evaluate the effectiveness and incremental cost of alternative flaring technologies and reconsider its policies and guidelines, with a view to promoting the use of higher technology. (See Section 4.3.)

2. While resource conservation continues to be an important consideration in matters relating to solution gas flaring, the more significant flaring issues in Alberta today are the perceptions of health and environmental impacts from emissions. (See Sections 6 and 4.1.)

3. Acknowledging that the cause-and-effect relationship between emissions from flares and health/environmental impacts are not well defined the Review Team believes, nonetheless, that the EUB's policies should be based on a philosophy of precaution and prevention. Thus, the EUB should continue to work towards reducing flaring wherever it is practical or necessary to do so. Sometimes this may result in a requirement to tie-in gas to prevent the waste of resources, and sometimes operators may need to reduce or eliminate flaring because of local environmental or social impacts even though such action could impair the financial attractiveness of some pools. (See Sections 5.2 and 6.2.)

4. Health and environmental concerns are manifest at both a local level, as between specific flaring batteries and individual residences, and at a regional level where flaring is pervasive enough to be of concern to entire communities. (See Sections 4.1 and 5.1.)

5. The EUB has been the primary initial contact, ongoing intermediary and ultimate arbiter for most flaring-related problems. The Review Team notes the concerns of some participants to the effect that the EUB appears to be transferring more of this responsibility to industry directly implying, to some, a diminishing role for the EUB. While the Review Team believes this concern is unwarranted, the EUB should take steps to reassure the public of its intentions in this regard. (See Section 9.2.)

6. The Review Team supports a regional approach to flaring containment/reduction in areas of Alberta where flaring is concentrated enough to concern communities. Although the EUB has tried such a "buffer zone" method of flaring regulation in the past, some details of the approach should be reconsidered for future applications of the approach. In particular:

A clearly defined and reasonably explainable flaring limit, or air quality objective should be considered for such regions. Whatever selection criteria are used for these rates — scientific or anecdotal evidence or arbitrary judgement — they should have the support of industry and the public, and might well be the product of the collaborative effort of those affected.

(a) Such a regional policy should identify the terms of operator participation; whether all operators of flaring batteries should be obliged to contribute in one form or another, or whether it suffices that some subset of operators bears the responsibility for the region. The EUB should consider its role and its legislative authority in the matter of the equitable distribution of the costs of "social capital" and, if it is desirable to do so, implement appropriate actions. (See Section 5.)

(b) The EUB should review all of its policies and guidelines respecting site specific flaring, such as flaring during times of gas plant turn-arounds, flaring during new well testing, and alternatives to flaring, to determine where further flaring reductions may be achieved. (See Section 4.3.)

(c) Although the Review Team recognizes the technical difficulties, the EUB should strive to implement any necessary flaring reduction and conservation plans in the early stages of development rather than as a reaction to situations that have already shown themselves to be serious. (See Section 5.)

Turning now to other issues raised during the focus groups (not necessarily in everyone's order of priorities), following are the Review Team's thoughts on issues related to the EUB's role in the debate on global warming, the perception of resource waste from flaring, the perception of uneven application of regulations, financial incentives/penalties, gas processing fees and communication:

1. The Review Team believes that if a formal policy to address the issue of greenhouse gas emissions is being contemplated by any government department or any other level of government, efforts should be made to ensure that such a policy dovetails with Alberta's regional priorities. (See Section 7.)

2. The Review Team acknowledges that, from a narrowly defined conservation perspective, significant additional recovery of solution gas volumes that are currently being flared, would require an outlay for capital, labour and other resources that would not be justified by the value of the gas, notwithstanding the fact that it is nonrenewable. (See Appendix A.) However, there will likely continue to be instances where flaring will occur in circumstances where the solution gas could reasonably have been tied-in. In the past the cost of maintaining the EUB's surveillance process has been easily justified by the value of the resources that have been conserved as a result of an EUB-initiated action. Therefore, the Review Team believes there will be a continuing rationale for the EUB to devote the resources necessary to ensure adequate resource conservation. (See Section 6.)

3. On occasion the EUB requires operators to cease flaring for site-specific environmental reasons, these being considered acceptable costs of producing oil. When the EUB requires such action by the industry, the rationale should be reasonably consistent across the province. Although some flexibility is necessary, such that different circumstances from one region to another may result in differing regulatory requirements, the same thought process should apply. As well, when environmental considerations indicate a need to tie-in solution gas, they should be reasonably explainable to industry. (See Section 9.)

4. The Review Team is not convinced that special royalties and incentives would be useful elements of an overall program to reduce flaring, particularly in view of their administrative costs. However, if industry believes that the royalty treatment of solution gas is an important factor in meeting environmental objectives, then such representations should be directed to the Department of Energy. (See Section 6.3.)

5. The industry has devoted considerable effort to develop a consistent framework for negotiating gas processing fees. The most recent guidelines are discussed in the report, "Joint Industry Task Force Report on Processing Fees (JP-95)". Since these guidelines were the product of a process involving both producers and processors, they may be considered representative of the acceptable ranges of fairly negotiated processing fees. However, this significant industry effort notwithstanding, there are liable to be times when producers and processors cannot reach mutually satisfactory terms. In the event that commercial agreements cannot be reached, remedial action is available under the EUB's legislation upon application by an affected party. The Review Team believes that producers and processors should seriously consider the principles embodied in JP-95 and its predecessor, JP-90, and that the EUB should continue to monitor industry's success in resolving such disputes. (See Section 6.3.)

6. The industry should continue its efforts to establish more effective communications between itself and the public. Also, industry should take a cooperative approach to technology development and information dissemination in areas that could result in a general reduction in the volume of flaring and emissions in Alberta. (See Section 8.)

Policy Review of Solution Gas Flaring and Conservation in Alberta

1. Background

The production of crude oil results in the release of dissolved gases. These solution gases typically contain methane and heavier hydrocarbons such as propane and butane, as well as carbon dioxide and, sometimes, hydrogen sulphide. Raw (or unprocessed) solution gas is either an asset or a liability to a producer, depending on the production circumstances. Key factors that determine whether the gas is a marketable asset or nuisance by-product are: gas composition, volumes produced, access to pipelines and processing facilities, and the stage of oilfield development, all of which combine to determine the potential revenues versus the costs of production.

In many oil production situations, the conservation of solution gas simply makes financial sense and the useful hydrocarbon fraction of the solution gas is separated and marketed. Very often companies pursue these initiatives independently, but sometimes the volumes are small enough that cooperative effort amongst several area producers is needed to generate economies of scale. At the other end of the spectrum, there are oil production situations where there is no economic means of conserving solution gas, either independently or collectively. These typically occur in new oilfield development areas where potential production volumes are uncertain, and in scattered, low volume production locations where the anticipated gas revenues do not justify investment in gas gathering and processing facilities. A practical means of dealing with solution gas in these situations is to capture and gather as much of the gas as possible, that might otherwise be emitted from several points within the production process, and direct it to a flare system at individual batteries for combustion. Flaring may involve the burning of all combustible gases produced in association with oil production, or combustion of only the hydrogen sulphide fraction once it has been separated from marketable hydrocarbons that may be present. In either case a flare stack is installed near the oil facilities, the unusable products are burned and the products of combustion are emitted to the atmosphere. In all cases the emissions must be within the province's ambient standards. It is this flaring that is the subject of this report. Figure 1 shows the historical data on solution gas conservation and flaring in Alberta.

Solution gas flaring is one, among several, of the environmental issues that captures the public's attention from several perspectives, ranging from potential global impacts to very site specific concerns. Global concerns generally revolve around the possibilities for climate change as a result of excessive amounts of greenhouse gases being vented to the atmosphere. As a byproduct of combustion of fossil fuels, carbon dioxide is thought by some to be a significant contributor to the phenomenon of global warming. Methane releases are also thought to play a significant role. National and regional issues stem chiefly from the potential for acid rain, which can occur when hydrogen sulphide is flared to form sulphur dioxide, which combines with water vapour in the atmosphere to form sulphuric acid. As well, there is a large group of site specific concerns that

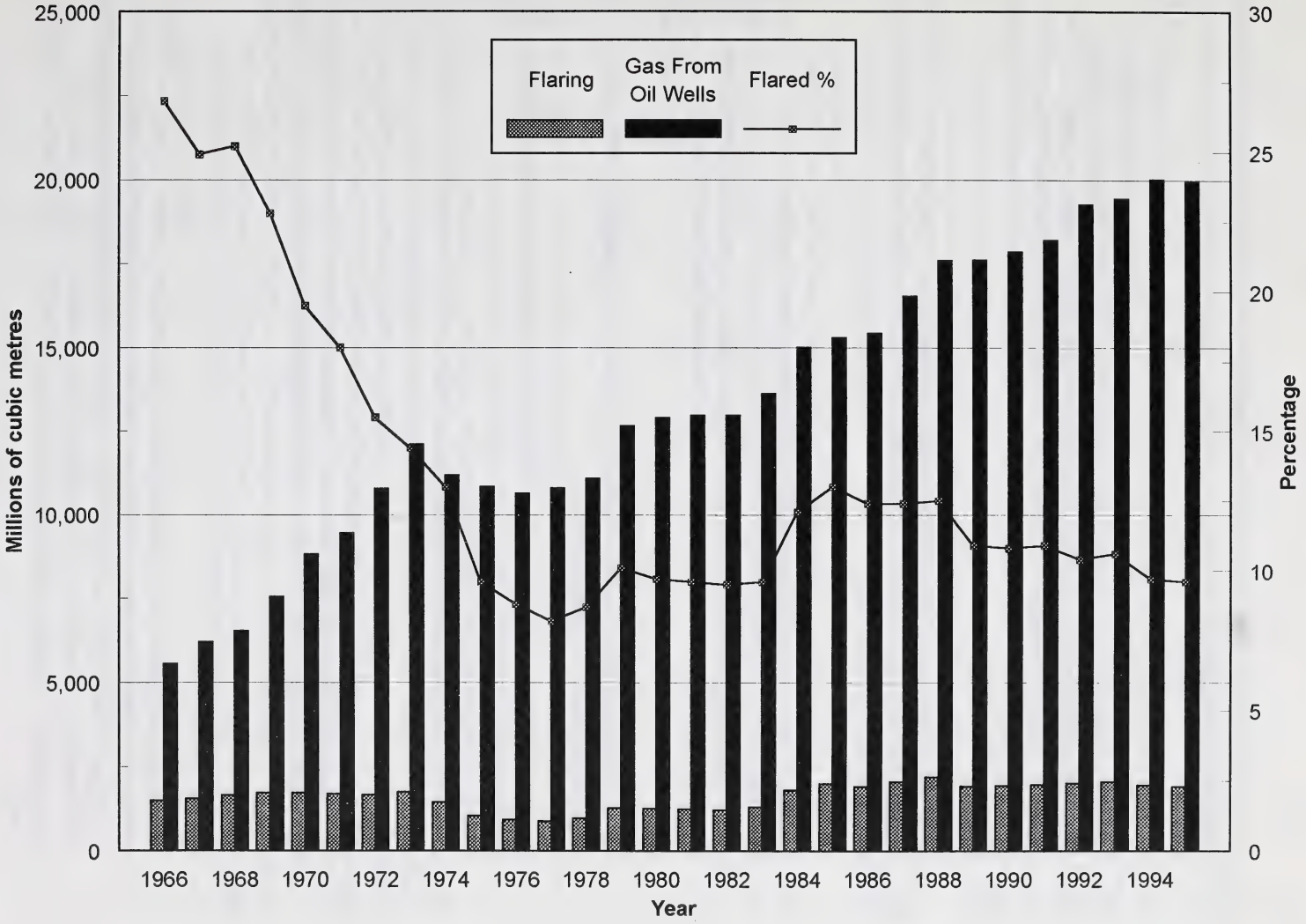
Flaring
Gas From Oil Wells
Flared %
25,000
20,000
15,000
10,000
5,000
0
30
25
20
15
10
5
0
Millions of cubic metres
Percentage
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
Year

Figure 1

include the potential effects of acid rain, and the potential for other local health and environmental impacts from flared solution gas.[1]

The EUB is acutely aware of the public's concerns about the practice of solution gas flaring. This experience comes through several facets of the EUB's operations: the application review and public hearing process; public complaints; through informal EUB Field Surveillance Group communications with the public; and as a result of more systematic customer surveys. The key issues appear to include: concerns about possible effects on human and animal health, possible environmental impacts, perceived waste of a natural resource, and aesthetic issues such as fugitive odours, noise and visual impacts.

In April 1996 the EUB requested staff to undertake a review of its policies respecting solution gas flaring issues. This report is the result of that review. The Review Team that was selected for the task was asked to do the following:

- with input from industry and the public, document the concerns with both solution gas flaring and the manner in which this activity is currently regulated,
- after considering the industry's and public's input, offer a Review Team perspective of the strengths and weaknesses of the current regulatory treatment of flaring issues,
- in those areas where the current method of regulation might need to be improved, suggest alternative approaches, and
- upon completion of the Review Team's report, again seek comments from industry and the public.

The Review Team was not asked to examine the scientific literature respecting the possible impacts of emissions on health or on the environment. Nor was it asked to draw conclusions as to an appropriate target level for emissions from solution gas flaring. Moreover, it ought to be noted that some scientific work was well underway at the time the Review Team undertook this assignment, and the EUB has clearly indicated its intentions with respect to recommendations that have been made. For instance, the Alberta Cattle Commission issued a report in July 1996 which, on the basis of a literature review, recommended several initiatives to investigate toxicological impacts of oil and gas activities on cattle. The EUB has declared, on several occasions, its

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[1] Hydrogen sulphide can also be flared and emitted as sulphur dioxide at gas plants that process sour gas. The standards for gas plant flaring were last reviewed jointly by the EUB and Alberta Environment Protection (AEP) in the late 1980's and were discussed in Informational Letter IL 88-13, "Sulphur Recovery Guidelines - Gas Processing Operations". A review of those guidelines is not part of this policy initiative. June 23, 1997

intention to follow up on the recommendations contained in the Cattle Commission's report even to the point, in a recent public hearing, of specifying its preferred approach to completing the work:

> "In its July 1996 report the ACC has made a number of recommendations. The EUB has committed publicly to follow up to the extent that it affects the EUB. This should be done with input from all affected parties. Respecting the impacts on cattle, the EUB believes that through a collaborative approach, which involves the broad spectrum of interested stakeholders, consensus can be reached on the most suitable and appropriate process that should be selected to address this issue. The EUB anticipates that a joint meeting of all interested parties would be the first step in formulating a plan and selecting a process that would allow objectives to be clarified, goals to be specified, the scope of the work to be mutually agreed to and the roles of the various participants to be established along with time lines that have to be met."

As well, the Review Team acknowledges the Alberta Research Council's recently published study of the combustion process, including field testing of two types of flare stacks in Alberta - one for sweet gas, the other for sour gas. It may be expected that the findings of that report will be the catalyst for additional research and focused investigations. (See Section 4.3 for additional details of the ARC study.)

2. Statement of Purpose

In the spring of 1996, the EUB issued an Informational Letter, "Solution Gas Conservation and Emissions Reduction" (IL 96-6) that set the stage for this policy review. The IL described the EUB's general responsibilities regarding solution gas flaring, and identified previous efforts at a regional approach to regulation — especially in situations where rapid oilfield development and consequent flaring were causing considerable public concern. The IL went on to state that the review process would ". . .examine the balance needed between efficient energy development, maximizing energy conservation and reducing the impacts of gas flaring on communities." With these objectives in mind, one purpose of this policy review is to explore the successes and shortcomings of the existing regulatory regime with an emphasis on regional issues. As a basis for evaluation, the Review Team needed to define the objectives of a solution gas policy. An ideal policy should:

- minimize conflicts between industry and the public in areas where solution gas flaring is a perceived problem,

- provide full information to industry and to the public, both on the regulatory framework and all other relevant aspects of flaring,

- be enforceable to ensure that appropriate actions are implemented by the oil and gas industry,

- maximize resource conservation, subject to the costs of recovering the resource,

- regulate consistently throughout the Province so that consistent criteria are applied everywhere. Such criteria may include area-specific factors such as the stage of oilfield development, population density, or environmental sensitivity. The criteria should have broad support of industry and the public, and

- provide a framework within which environmental implications of solution gas flaring can be assessed.

The EUB requested that the Review Team include representation from both industry and the public in this process, one objective being to obtain a thorough understanding of the issues associated with solution gas flaring. In designing the consultation strategy the Review Team selected three regions of high oilfield activity. To understand how the public and industry perspectives might change over time, the regions chosen typified different phases of oilfield development.

3. Study Process

The EUB reviewed several process options for developing a policy on solution gas flaring, which included a formal public inquiry, minimal external consultation, and an informal public and industry consultation. The EUB believed the last approach would allow for a reasonable and timely airing of concerns and would engage both industry personnel and the public in identifying issues and proposing solutions. The Review Team was asked to proceed accordingly.

The Review Team designed the process to have two phases. Phase one included three community consultation sessions with documentation of the issues identified by the participants. This report is the culmination of the second phase, which consisted of a staff review of the issues, a description of the current regulatory process, and a discussion of possible solutions in those areas where changes to current policies should be considered. Attached as an appendix to this report are the comments received from the focus group participants on a draft version of the Review Team's analysis.

After consulting with senior EUB Field Surveillance personnel throughout the province the regions surrounding Red Deer, Wainwright, and Taber were selected as sites for the three focus group sessions. The Review Team designed the sessions to include a balance of public and industry representatives who live and work in each region. Staff from each region contacted potential representatives, outlined the purpose and process of the initiative, and invited their participation. Industry representatives were identified from companies active in each region, and public representatives generally had expressed an interest in, or concern about, the practice of

flaring or are active in community issues. The Review Team provided information to all participants before the focus group sessions, which included facts about flaring regulations and the location of regional solution gas flaring facilities. A professional facilitator was hired by the EUB to conduct the focus groups and to provide a report on the results of each session. The sessions were conducted according to the following agenda:

- overview presentation on the issue of solution gas flaring and explanation of the purpose and process of the policy initiative,
- identification of solution gas flaring concerns/needs by each participant, with a discussion to clarify comments as necessary,
- grouping of concerns/needs statements by topic area,
- prioritization of topic areas,
- break-out groups to generate possible solutions for each topic area, and
- final discussion of solution statements.

In the interest of having a manageable discussion and to allow time for the participation of each representative, the focus groups were limited to a maximum of 20 participants. This was not regarded as a serious limitation since it was not the Review Team's intention to establish a statistically significant survey of opinions. Rather, the main concern was to ensure that important issues were not overlooked. The fact that similar themes emerged from each of the sessions, and in a similar order of priority, suggests there are no important gaps in issue identification. Consultation sessions were held on 19, 20, and 25 June 1996 in Red Deer, Taber and Hardisty respectively, and the results were provided to participants approximately one month later.

Following is a list of the major topic areas that emerged from the focus groups:

- site specific environment,
- regional environment,
- resource conservation,
- global environment,
- communication, and
- regulatory efficiency.

The Review Team believes that all of the issues identified during the focus groups fall within one of these subject areas and the balance of this report has been organized to address each in turn. The report format consists of a summary of the nature of the concerns raised during the discussions, a description of the current regulatory processes that are (or are not) in place to deal with them, and then the observations and recommendations of the Review Team.

4. Site Specific Environment

4.1 Participants' Views

The most important issues raised by non-industry participants related to their concerns that flaring may be a risk to personal and livestock health. The recurring theme from both industry and non-industry participants was that the scientific evidence is not advanced enough to substantiate any claims about the likely impacts of flaring.

The potential for other environmental impacts was the next most significant source of concern, including the effects of emissions on vegetation, the potential for excessive soil acidification, and faster depreciation of farm equipment and buildings due to the suspected corrosive effects of emissions. These were followed by concerns related to aesthetic factors such as visual impacts (black smoke as well as the presence of oilfield equipment on the landscape), odours, and noise.

4.2 Current Regulatory Process

Regulatory responsibility for environmental issues associated with oil and gas activity is shared by AEP and the EUB. AEP is responsible for setting and enforcing ambient air quality objectives that describe the acceptable upper limits of several pollutants in the environment, hydrogen sulphide (H_2S), sulphur dioxide (SO_2) and nitrous oxide (NOx). AEP licences emissions from larger facilities such as gas compressor stations and gas processing plants, specifying maximum emissions from stacks, taking into account the design of the stack, topography, atmospheric conditions and the modelled dispersion of pollutants. AEP monitors these operations to ensure that emissions are within the specified limits.

Approvals for oil batteries are granted by the EUB. An important part of the EUB's review process includes flare stack design. Standards are such that operators must be able to comply with the province's air quality objectives even with maximum flare rates and worst case meteorological conditions. Compliance is confirmed through periodic monitoring by the EUB, which is occasionally supplemented with site specific battery monitoring performed by AEP. The latter most often result from complaints to the EUB from area residents.

The air quality objectives adopted by Alberta are designed to ensure that ground level concentrations of H_2S, SO_2 and NOx do not cause environmental damage. AEP personnel, along with the other provinces' environment departments, participate in exercises coordinated by Environment Canada which periodically review emission objectives. AEP has developed criteria for pollutants that are of greatest concern or that are emitted in the greatest volume. Thus, while there are limits on the amount of sulphur dioxide and oxides of nitrogen that may be emitted in

various gaseous forms, other pollutants such as hydrocarbon gases are not regulated beyond the requirement that they be burned.

While much attention is paid to the emissions from oil battery flare stacks, the operation of a battery can result in emissions from numerous other sources, which are called fugitive emissions. Fugitive emissions occur as equipment fittings age, or they may result from poor maintenance of equipment, inappropriate operating practices, or operator error. It should be noted that no matter how well maintained a facility may be, some fugitive emissions are almost inevitable. Occasionally equipment failure results in emissions that exceed the province's air quality objectives, however, these are usually detected and repaired promptly.

Fugitive emissions sometimes turn into nuisance odour problems when they impact area residents and result in complaints, even though the operator may be in compliance with current air quality objectives. In these cases the EUB works with operators in the area to reduce odours. When a complaint is registered with the EUB's Field Centre staff (which may relate to a spill, noise, smoke, odour or other problem), the EUB directs operators in the area of the complaint to identify the source and to take remedial action. Sometimes this requires the facility to be shut in, either voluntarily or as the result of an EUB order. The operator is also requested to notify the person who registered the complaint and to advise on the corrective action that has been taken. The EUB typically deals with about 1000 complaints per year in this fashion.

4.3 Review Team's Views

The Review Team believes that, in whatever manner the EUB may alter its current approach to regulating solution gas flaring, the public ought to be assured of the EUB's continued accessibility and commitment to dealing with site specific concerns. This principle should be maintained regardless of regional or provincial initiatives that may be acted upon, as suggested elsewhere in this report.

Of the many compounds emitted by Alberta's industrial and commercial facilities, regulators endeavour to focus on those emissions with the greatest potential to have an adverse effect on some aspect of the environment. Regulations to date have reflected the view that effective environmental protection does not require standards or objectives to be set for each of these potential emissions. Nor would it be practical to measure and enforce such an exhaustive list. However, a recent study by the Alberta Research Council indicates that the components of flared solution gas likely include a broader spectrum of compounds and in larger volumes — albeit still very small — than was previously thought to occur[2]. The sponsors of the research issued a news release on the report which stated that computerized plume modelling,

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[2] The Alberta Research Council's study, "Investigations of Flare Gas Emissions in Alberta" was published in November 1996, while the focus group sessions were held in June.

> ". . .indicated concentrations of the emitted compounds would be very low at ground-level. For those compounds where standards are available, such as sulphur dioxide, the modelling indicates that the air quality near the flares would meet these standards. For other compounds that do not have air quality standards, the modelling indicates levels that could approach those found in several Canadian cities."

While the sponsors' news release suggests that the findings are not of an order of magnitude to require immediate implementation of stop-gap regulatory measures, there is a clear expectation of specific follow-up to determine whether or not additional controls or actions ought to be considered. The Review Team is aware of a request from the Canadian Association of Petroleum Producers (CAPP) asking that the Clean Air Strategic Alliance (CASA) appoint a task group of interested stakeholders to develop a terms of reference for establishment of a project team. The team would be asked to review the use of flares for management of waste gases and protection of public and worker safety, assess the effects of flaring on air quality, and identify the potential risks associated with flaring to humans, animals, and the environment. The Review Team is also aware of CASA's recent acceptance of this CAPP request and that a preliminary terms of reference would be developed prior to the March 1997 CASA EUB of Governors meeting.

In the meantime the Review Team believes there will be added pressure on industry and the regulators to reduce the volume and improve the technology of flaring in the Province. A cooperative approach could hasten the resolution of some of the issues. *In particular the Review Team believes that the following areas should be assessed for their potential to alleviate the public's concerns:*

- *technology sharing and development, for processes that could be viable alternatives to flaring such as gas reinjection, or solution gas scrubbing,*
- *improving flaring technology,*
- *facilities planning in areas where the concentration of flaring batteries and volumes flared are concerns to, or have the potential to be concerns to, nearby residents and communities,*
- *policies and guidelines respecting solution gas flaring that occurs as a result of gas-plant-turnarounds,*
- *guidelines governing flaring when a new oil well is being tested,*
- *flaring practices for new gas well tests, and*
- *industry's use of mobile compressors to draw down pipeline pressure prior to performing tie-ins and line maintenance.*

5. Regional Environment

5.1 Participants' Views

The concerns discussed under this heading are virtually identical to those discussed in section 4.1, under "Site Specific Environment", albeit on a larger scale. By far the most important concerns raised during the community discussions focused on the potential long-term cumulative health effects of multi-source pollution, for both humans and livestock. Fallout contamination was thought by some to contribute to soil degradation and acidification, and faster corrosion of buildings and farm equipment. Aesthetic factors such as sour gas odours, noise, black smoke, and other visual impacts were also major irritants.

Some suggested that flaring should be eliminated entirely and that a schedule should be set accordingly. Others pointed out that the scientific basis for eliminating flaring is presently too ambiguous to justify such strong action, and there would be a tremendous cost to society to implement it. An alternative, supported by some industry and non-industry representatives, was that well defined regional policies could limit flaring around communities — as buffer zones — and could be based on, for example, regional differences in the volumes of gas being flared, gas composition (for instance, sweet versus sour gas), and proximity to communities.

5.2 Current Regulatory Process

The EUB's standard practice has been to deal with each flaring problem on an individual basis. This approach can be effective when the number of participants is small, but it can be quite unwieldy when there are a large number of operators near a populated area. Over the past few years there has been an increasing number of instances where significant oil reserves have been discovered in close proximity to communities. The pace of development, coupled with the poor economics of solution gas conservation in most cases, led to a rapid increase in the volume of solution gas being flared in these areas. The impacts — real or perceived — were manifest in complaints about odours, fear for personal and livestock health, and the visual impacts of concentrated industrial activity where previously there was very little. In situations where the individual problems had the potential to become collectively unmanageable the EUB has taken more of a regional approach to problem solving, with a view to reducing and containing the rate of flaring over a number of townships. Several of these examples were listed in IL 96-6, and one in particular is discussed below.

The Hansman Lake area encompasses the dozen or so townships northwest of the town of Provost (see Figure 2). While there was some oil activity in the area prior to 1991, production was from a few scattered reservoirs of sweet and sour oil with small volumes of solution gas which were flared. Development took off in earnest in 1991, however, with the discovery of reservoirs containing primarily sour oil, and the region is currently marked by pockets of closely-spaced oil wells. Each operator's volume of solution gas production was too small to warrant the cost of facilities to collect and process it and, in any event, the nearest Nova tie-in point was 30

kilometres away. Economic factors did not justify even a cooperative effort to tie-in the gas for conservation purposes, and there was no apparent thought being given to tieing-in the gas for purposes of reducing local emissions. Flaring became the accepted method of disposal. By the summer of 1994 there were almost 6 million cubic metres per month of solution gas being flared in the region from 70 oil batteries. Despite the volume of gas being flared very little, if any, occurred in pockets large enough to justify installation of the equipment necessary for its conservation. However, as the volume of flaring increased, so did the number of complaints from rural residents and from people living in the nearby town of Provost. The nature of the concerns most often related to odours and perceptions of adverse effects on human and livestock health.

Although the battery operators were not violating any provincial air quality objectives, the EUB felt obliged to ease the emerging tension between industry and residents, as well as the strain that was being imposed on the EUB's ability to cope with the growing numbers of complaints. The EUB's approach was to notify the operators of the 20 largest producing batteries in the region that timely gathering of solution gas was necessary, whether or not this was a financially attractive prospect. The operators were free to determine amongst themselves the optimal method for tieing in the gas, so long as it occurred. After several meetings there appeared to be some resistance to the idea, and the EUB threatened a 25 per cent flare restriction for the three largest flaring batteries unless immediate action was taken.[3] Several proposals for gathering and processing facilities were submitted along with plans for acid gas injection, and gas processing operations commenced in the summer of 1994. Soon after the processing facilities began operating the volume of flaring declined to about 2 million cubic metres per month, nearly one-third of the peak level, with a commensurate decline in emissions. As well, based on the declining number of complaints to the EUB, many of the regional problems were resolved once the volume of solution gas flaring was reduced.

This is one example of the EUB requiring solution gas gathering for social and environmental reasons, despite the likelihood that financial considerations alone favoured flaring over conserving the gas. In this instance the EUB believed that the social costs of flaring outweighed the financial penalty that companies would incur by conserving the gas, and that the costs of avoiding flaring should be considered a legitimate cost of producing oil in the region. This example also represents a departure from the traditional site-specific sort of controls usually implemented by the EUB, in recognition of the fact that a broader based regulatory policy was warranted and would be more effective.

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[3] Such a flare restriction would have reduced the volume of oil that could have been produced by operators who failed to implement an alternative plan to flaring by the given deadline. The EUB's directive actually specified increasing restrictions on flaring to the point where these operators would have had all of their production shut in unless a conservation plan was implemented.

5.3 Review Team's Views

While regulations tend to be geared towards site-specific concerns and battery-specific solutions, the EUB's experience with the Hansman Lake region suggests that a regional approach to problem solving is a viable regulatory alternative. The concept appears to have been contemplated in the Oil and Gas Conservation Regulations where there are several directives similar to Section 7.070 (6), dealing with solution gas flaring, which reads:

> "The EUB may, on application, exempt a battery from any provision of this section where, in the opinion of the EUB, the nature of production, the remoteness of the area or any other circumstance warrants the exemption."

This directive suggests that regional differences can be considered if operating standards are to be relaxed. By the same token, the EUB clearly stated in IL 96-6 that regional differences can be considered if operating standards need to be tightened:

> "The environmental effects of flaring are also an issue for the EUB, particularly when they trigger broad-based public complaints. This is most likely to happen in cases where rapid and intensive development is occurring in populated areas. Attachment 1 lists several areas where these conditions have occurred recently, and where the EUB has found it necessary to set out area gas conservation requirements to address community concerns."

Indeed, such a regional approach was identified during the focus group sessions, the nature of the suggestion being to consider imposing limits on flaring — or flaring caps — near populated areas where flaring is regarded as a serious enough problem to warrant intervention.

The Review Team believes there is considerable merit in this idea and that, with some improvements, the approach taken in the Hansman Lake area of Provost could be adapted to other regions of the province. The Review Team has given some thought to the principles that might be embodied in such a policy, but before discussing those it is worthwhile to revisit the Hansman Lake episode.

With the increase in residents' concerns in the Hansman Lake area after 1991, the EUB's response was to identify the 20 largest flaring batteries (from a total of 70 in the area) and hold their operators accountable for resolving the problems which, after some debate, resulted in the installation of gathering and processing facilities. While the immediate problem was more or less resolved, indications are, from some parts of the industry, that the plan could have been better executed. Shortcomings in the EUB's approach that have been noted by industry and by the Review Team include:

- the "free rider" effect, by assigning the entire burden of the perceived environmental problem to only a few of the operators in the region,

- inconsistent enforcement of the apparent new rules of operation within the Hansman Lake area,

- the lack of a predetermined objective for the region, in terms of solution gas flaring, and

- the tendency of industry and regulators to react to these situations after they have reached a boiling point, rather than to anticipate regional trends in industry activity and establish appropriate ground rules earlier in the process.

The free rider effect occurred at two levels. First, the EUB singled out the 20 largest flaring batteries and assigned the operators of those batteries the task of resolving the problem. Even though the remaining 50 operators were, for the most part, flaring small volumes they were not obligated to contribute to the solution, either directly by reducing the volume they flared, or indirectly by helping to finance the facilities of those operators who did assume the task of conserving gas. Thus, the entire financial burden fell to a few while the rest were untouched. With this there was a group of "winners"; the majority of operators who were regarded as too small to require conservation of, and "losers"; those operators of larger flares who were required to carry the ball for all. There was no mechanism to require the winners to compensate the losers.[4]

Second, nothing was done to ensure that, even amongst the few operators of the large volume flares who were "leading the way", all would be bound by the same operating standards within the region. Nor, for that matter, was there a method for bringing newcomers who flared larger volumes into the fold. Consequently, some operators continued to flare solution gas while others incurred a financial cost to conserve their's. This inconsistent application of the new local standard has been a particular sore point with some companies.

Perhaps most importantly, there was no predetermined objective for the regional policy. As it was, while a reduction in flaring was called for, nobody established how large a reduction was necessary. Presumably this was to be a judgement call after the fact.

The Review Team believes there is considerable potential in the general approach that was tried, however, some of the underlying principles ought to be more carefully considered. For instance:

- *an air quality objective should be considered for the region, in terms of a maximum level of flaring and/or emissions to which industry is obliged to adhere, and*

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[4] This would be of little consequence if industry generally agreed that it was reasonable for battery operators with larger flare volumes to be responsible for the costs of resolving the regional problem. However, industry's preference on this matter was not explored at the time.

- *the appropriate level of operator participation should be decided at the outset, whether all operators should be obliged to contribute to the resolution of problems, or if it is acceptable for some subset of operators to bear the responsibility.*

Assuming that the regulators, AEP and the EUB, would ultimately be responsible for defining any regional objectives for flaring/emissions, selecting the objective could be unilateral and arbitrary or it could be based on a consensus from among those affected. As an example of a unilateral and arbitrary process the regulators could begin by defining the boundaries for a region wherein flaring is a problem (or has the potential to become a problem). After considering any evidence that is deemed relevant, presumably some combination of historical data, and available scientific and anecdotal evidence, the regulators could set a maximum limit on the volume of solution gas that could be flared within that region. Alternatively, the process for determining such a regional flaring cap could invite input from all interested parties, perhaps through CASA, with a recommendation to the EUB.

The level of participation is another key element to consider. If a truly level playing field is desirable, then all operators of flaring batteries should participate. A system of tradeable flaring permits is one option that could be considered to accomplish this objective.[5] On the other hand, if it suffices that a particular group should bear the burden, then steps should be taken to ensure that all within that group share the responsibility.[6]

Finally, there would be considerable merit in anticipating where regional "hot-spots" of activity are likely to emerge, so that appropriate actions can be initiated in the early stages of a region's oil and gas development.

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[5] This is a mechanism for industry to sort out the most efficient way of working within a given constraint which, in this instance, could be a regional flaring cap. The permitting system would ensure that all operators participate, either directly by reducing the volumes flared or indirectly by compensating others within the region for reducing the volumes that they flare. Either way the environmental goal for the region would be met. While the regulators would establish the environmental objective, the permitting system would merely allow the associated costs to be shared.

[6] Under this approach the basis for determining inclusion in the group responsible for environmental management is usually defined in terms of a threshold volume of gas flared and SO_2 to be emitted. Those exceeding these minimums are obliged to conserve the gas, while those flaring less may continue to flare. Rather than achieving a narrowly defined version of a "level playing field", this can result in a proliferation of battery configurations that flare less than the threshold volumes, which thwarts both the objectives of fair play and flaring/emissions containment.

6. Resource Conservation

6.1 Participants' Views

Although most of the non-industry representatives were concerned that flaring implies the waste of a non-renewable resource, it was generally acknowledged that there are practical limits to the extent that solution gas can be conserved, as in remote areas or where the volumes are too small to justify the installation of expensive conservation equipment. However, there was a sense that despite such limiting factors there is more solution gas being flared than can be justified on economic grounds, especially if the profits from a battery's oil revenues are rolled into the equation.

Some, again from amongst the non-industry participants, thought that a royalty should be assessed on flared gas because it is a Crown resource like other marketed gas reserves, and a royalty payment would help compensate for the perceived environmental costs of the flaring activity. Others, particularly from amongst the industry representatives, noted that there are cases where preferential royalty treatment could encourage operators to conserve small volumes of solution gas that would otherwise be flared. Of particular interest were the possibilities of such a policy for small-scale on-site electricity generation.

Some participants thought that regulators should play a larger role in legislating processing fees so that producers could have better access to gas plants.

6.2 Current Regulatory Process

One of the mandates of the EUB is to ensure that Alberta's energy resources are developed in accordance with the public interest. The purview of public interest includes two of the major issues that are the subject of this report: conservation of non-renewable resources and the potential for environmental/health impacts from energy resource production. This section addresses the EUB's approach to conservation issues with only a peripheral reference to environmental/health matters, which were considered in more detail in earlier sections of this report.

The EUB has the primary responsibility for ensuring that waste does not occur in the course of producing the province's energy resources. With respect to the issue of gas flaring the EUB has fairly broad authority as described by Section 25 (b) of the Oil and Gas Conservation Act, which states:

> "In order to prevent waste, the EUB. . .may require that any gas, on its production, be gathered, processed if necessary, and the gas or products from it marketed or injected into an underground reservoir for storage or for any other purpose."

Unfortunately, "waste" is a relative term and, although the Act suggests some general topics that ought to be considered, the specific details of items like economic tests are left to the discretion of the EUB. The Act describes waste as:

> "the escape or the flaring of gas, if it is estimated that, in the public interest and under sound engineering principles and in the light of economics and the risk factor involved, the gas could be gathered , processed if necessary, and it or the products from it marketed. . ."

The EUB has engaged in many debates over the years to try to define the most appropriate criteria for determining the difference between waste and acceptable production practice. Many of the points of debate were raised as issues during the focus group sessions. In brief, the EUB takes the following philosophical approach to the conservation aspects of solution gas flaring.

From the point of view of narrowly defined economic efficiency, solution gas is an asset when it is present in volumes sufficient to justify the installation of gathering and processing equipment. When the volumes are too small to warrant such capital expenditures, solution gas becomes a liability that requires disposal. The EUB takes the view that industry should not be forced to recover solution gas when the recovery costs would exceed the value of the gas and associated liquids, unless there are other public interest issues that necessitate its recovery. So long as it is evident that production costs would exceed market value, and barring other public interest issues, the EUB accepts that from a conservation perspective flaring is an acceptable means of disposing of, what amounts to, a waste product. This approach implicitly assumes there are no environmental or health costs associated with flaring that meets ambient guidelines.

From a resource conservation perspective, industry generally recovers the appropriate volumes of solution gas of its own accord. As noted above, this only makes sense. Exceptions to this rule do occur, however, and the EUB sometimes intervenes to force conservation where industry would likely have continued to flare the gas. These exceptions occur for two generic sorts of reasons: differences in financial assessments by different companies, and lack of cooperation amongst companies in planning facilities.

First, each company has its own interpretation of economic viability such that a project (gas conservation or otherwise) that might look like a dead-weight loss to one company, could appear profitable to another. There are any number of reasons for such differences in perspective. For example, geological assessments and associated production are subject to a wide range of interpretations with different companies drawing their own conclusions about the potential revenues from a given formation. The cost of capital is certainly important, given the wide range in risk premiums that financial markets demand of different companies. Thus, to a high-risk company with few assets a gas conservation project could appear to be a considerable drain on its limited pool of funds, with the prospect of a financial loss. To a larger, blue-chip company the same project might look like an incidental investment — and perhaps profitable — especially if intangible benefits are considered. Differences in production expertise and marketing ability,

differing views of future commodity prices, accessibility of complementary facilities such as gathering systems and processing plants, even something as fundamental as a company's definition of "core process", are just a few of the reasons for shifts in perspective, with the potential for each factor to change from month to month. It would be very coincidental for any two companies to view the same project the same way. However, when the differences in perspective become significant enough to cause a waste of resources - according to the EUB's definition of waste — then companies are required to conserve the resources.

The second category of reasons for EUB intervention in the conservation aspects of solution gas management relates to the fundamentally competitive nature of the industry. The EUB has noticed, more frequently of late, that pockets of solution gas are sometimes flared when they could be reasonably conserved if competing operators would combine their efforts to plan a more efficient overall process - basically by taking advantage of economies of scale. The most significant impediment to this process is the tendency of most operators to have regard only for their own facilities without considering the activities of others in the same region. When the EUB encounters a situation of this nature, then corrective action is taken.

The EUB becomes aware of cases of wasteful solution gas flaring as a result of inspections by its Field Centre personnel and through periodic staff reviews of the EUB's data files. When questionable flaring operations are identified, the producers are asked to provide the economic basis for continuing the practice. Upon critical review, the operator(s) may be allowed to continue flaring or they may be required to conserve the gas.

Although the EUB maintains some flexibility and is willing to accommodate differing corporate circumstances to some extent, the general approach is to require conservation when economic indicators suggest that an "average" company would at least recover its costs. Typical underlying considerations for the analysis would be that the production function for solution gas tends to be fairly predictable, that gathering and processing costs can be reasonably estimated, and that market prices are transparent. (These conditions would be totally different to an analysis of, for example, a wildcat well in an unexplored region of the province.)

It is generally acknowledged that a narrowly defined cash flow analysis, which compares the market value of products to the capital and operating costs used during production, does not consider "externalities" such as environmental or third party impacts arising from production and transportation activities. While this kind of information would be very useful to have, the EUB believes that the art of estimating externalities is currently too speculative to be of much formal assistance in a broadly defined benefit/cost framework. Therefore, the EUB uses economic analysis as one input, among several, to assist with an array of judgement calls that must be made on solution gas flaring issues.

On the matter of regulating gas plant processing fees to allow easier access for producers of solution gas, the EUB's policy is to allow industry to resolve, as far as possible, such issues without regulatory interference. Industry recently issued a report on this subject under the title,

"Joint Industry Task Force Report on Processing Fees" (abbreviated to "JP-95" after the prototype Jumping Pound formula for determining processing fees). JP-95 is intended as a guide for determining equitable processing fees to assist in negotiations between producers and gas processors. This is one example of industry attempting to resolve issues outside of the regulatory forum, however, if any individual believes that undue advantage is being taken of a given situation, as in access to gathering systems and processing plants or excessive gas processing fees, legislation exists that enables the EUB to intervene on request.

6.3 Review Team's Views

The Review Team believes the EUB's current regulatory approach to solution gas conservation continues to be appropriate. The total volume of gas flared in Alberta suggests to some that a resource is being wasted, however, the Review Team believes that very little of the flared gas could be recovered without a significant financial impact. This view is borne out by the analysis contained in Appendix A, "The Additional Costs of Further Solution Gas Conservation in Alberta", which indicates that a significant change in the volume of solution gas recovery would not be justified by the value of the gas. In other words, had the solution gas been conserved, there would have been a waste, but of different resources.

The concern was expressed during the focus groups that the Province may be sacrificing significant gas royalties when it allows solution gas to be flared. However, gas royalties are intended to be the Crown's share of the profits of the marketable products of resource extraction. Since solution gas that is being flared currently is most often unprofitable to collect in the first place there would be little, if any, revenue left over to be shared between industry and the Province if these volumes were conserved. The other reason for attaching a charge to flared gas, as a means of compensating for environmental impacts, is addressed below.

The EUB's regulatory process acknowledges that economic analysis is not equal to the task of determining a market value equivalent for the environmental impacts of flared solution gas. The scientific basis for adducing impacts is far from absolute and, even where such evidence is clear any imputed market values are, at best, very rough approximations of the value of environmental impact. The Review Team believes, therefore, that any compensatory levy charged against flared gas, in the fashion of a carbon tax, would accurately reflect the "real" version of the facts only by sheer coincidence. Even if the intention was merely to impose a deterrent against flaring without worrying about the accuracy of the tax, the regulatory efficiency of this method would be questionable, and the Review Team doubts that the results would justify the administrative difficulties. *If a reduction in the rate of flaring is the desired goal, either for the province as a whole or for particular areas of the province, then a more direct approach should be sought than a tax on flared gas.*

There was a suggestion from several participants that financial incentives, such as a royalty rebate or other financial instrument, should be considered for battery operators who tie-in their solution gas and incur a net loss in the process. *The Review Team is mindful of the administrative*

difficulties of specific royalty incentive programs. However, if industry believes that such a policy is essential, then industry should discuss the matter with the Department of Energy, as the authority responsible for Alberta's royalty administration.

One theme that often emerges, as it did in the focus groups, is that the EUB should include oil revenues in its cash flow analyses of potential solution gas conservation projects. This view holds that since oil and gas are co-products in the reservoir, all the revenues and costs should be considered together. From the specific perspective of resource conservation, the Review Team disagrees. Oil and gas become separate products when they reach the surface, and are subject to different processing techniques. So if the only issues relate to conservation and efficiency, then gas should only be conserved when the value of the gas, appropriately defined, at the very least covers all costs of recovering it. Otherwise gas is being saved through the wasteful use of other resources and the net benefit is negative. However, as intimated above, the question becomes more complicated when environmental impacts are admitted to the analysis. In this case it can be argued that the production of oil involves production of a waste by-product, solution gas, and the solution gas is being disposed of or "dumped" in the atmosphere. To the extent that such disposal has environmental effects, the cost of mitigating those effects should be attributed as a cost of the oil. If such impacts were easily quantifiable they could be added to the revenue/cost equation and appropriate signals would emerge. But because the atmosphere has a capacity to assimilate the waste product, impacts are not easily identified or quantified. At present, no reasonable way to include them in decision-making, other than through subjective judgement, has been found.

Usually the EUB's "conservation watchdog" function requires a few person-years, depending on industry activity. The Review Team believes the public is well served by this regulatory pursuit and, further, that there will be a continuing need for it. The main reasons for EUB intervention in the first place are because some companies use inappropriate criteria in evaluating such projects, and sometimes operators miss opportunities to combine their efforts to plan a viable project. While there are likely to be several areas where the accountability of industry may be increased with a commensurate reduction in regulatory intervention, these particular aspects of resource conservation are unlikely candidates for such a policy shift. Thus, the Review Team believes there will be a continuing public interest need for surveillance to ensure that problem situations are dealt with. Although some companies have a similar corporate mission — to identify opportunities to conserve gas that is flared by others — these companies are more a complement to the EUB's process than they are a substitute for it.

Finally, the Review Team believes the EUB should continue to support industry's efforts to resolve gas processing fee issues independently of the EUB. Should the guidelines that have been developed by industry fail to resolve all issues amongst all companies, there is adequate legislative provision to refer grievances to the EUB as the arbiter of last resort.

7. Global Environment

7.1 Participants' Views

The potential effects of excessive flaring on global warming was a concern of several participants. This phenomenon is sometimes thought to be the product of venting and combustion of fossil fuels, in combination with deforestation, agricultural practices, synthetic chemicals, and industrial processes which, by some theories, alter weather patterns and contribute to a warming trend around the world.

7.2 Current Regulatory Process

Most of the initiatives designed to address issues surrounding global warming have been the result of international agreements. Canada's strategy for working toward its national objectives are largely based on voluntary action.

The Canadian government currently sponsors research which tends to support the theory that human activity contributes to global warming by increasing atmospheric concentrations of green house gases such as carbon dioxide, methane, and nitrous oxide. As early as 1979, when the World Climate Program assembled governments and climate scientists, global awareness of the greenhouse effect and its impact on global climate change began to increase. Canada has maintained a high profile among concerned nations and has actively participated in international initiatives. In 1990, Canada participated in the Intergovernmental Panel on Climate Change. Canada also figured prominently in the development of the Framework Convention on Climate Change, a treaty adopted at the June 1992 United Nations Conference on Environment and Development (the "Earth Summit") in Rio de Janiero. The Convention became effective in March 1994. In response to its climate change commitment to aim to stabilize greenhouse gas emissions at 1990 levels by the year 2000, the federal, provincial, and territorial Energy and Environment Ministers developed, in February 1995, Canada's National Action Program on Climate Change. While Canada's National Action Program includes a mix of initiatives, cost-effective voluntary actions form the basis of the program.

Finally, since 1991 the Canadian Association of Petroleum Producers (CAPP) has sponsored the creation of voluntary programs designed to reduce unnecessary emissions of greenhouse gases. In response to studies of possible emissions reduction action at gas processing plants, a voluntary program was implemented to perform energy audits and improve methane recovery in the gas processing industry. In cooperation with the Canadian Energy Pipeline Association (CEPA) and the Canadian Gas Association (CGA), CAPP is working to reduce methane emissions produced by gas processing plants and pipelines. CAPP was also instrumental in the creation of a nation-wide home energy audit program.

Currently the EUB's regulatory processes do not specifically address issues related to global warming. The EUB has regarded its environmental mandate as encompassing regional and site-

specific concerns. While emissions controls that impact at a regional level must also contribute to national and international emissions reduction programs, this is only because regional objectives complement such initiatives; not because the EUB regulates industry activities because of fears of global warming.

7.3 Review Team's Views

The Review Team believes that should compulsory standards take effect at some time to address greenhouse gas emissions, the EUB is well placed to assist with their implementation. That is, if a regulation were introduced with the intent of reducing the total volume of flaring in Alberta, for example, it would be well to mesh such a policy with the EUB's mandate to minimize regional and site specific conflicts. Another way of looking at it would be to achieve national goals through regional policies.

8. Communication

8.1 Participants' Views

Some non-industry participants confessed to a lack of understanding of some of the flaring problems, which reinforced the need for better access to information. Indeed, the major recurring theme emerging during the sessions was that more and better information is needed on the quantification and nature of the toxic compounds emitted from flare stacks, with an assessment of their effects on human and livestock health. Non-industry participants expressed an interest in learning about different technologies, and combustion versus non-combustion techniques for reducing any impacts from emissions. Industry representatives noted that odours may come from many sources and that fugitive emissions required a different sort of consideration than issues relating to solution gas flaring.

All participants urged open communication between industry, government, and the public. Some preferred group discussions rather than one-on-one meetings to facilitate exposure to a broader range of issues. Some residents expressed frustration over their inability to identify and locate the appropriate people to address their concerns, and called for more timely notification in case of incidents (such as spills, odours and noise) that might affect them.

8.2 Current Regulatory Process

The EUB requires companies operating under its jurisdiction to conduct public notification and consultation programs in advance of applying for new developments or when significant changes to existing developments are contemplated. Notification requirements flow from the EUB's quasi-judicial role whereby parties that may be directly and adversely affected must be notified and informed about the development. Public consultation requirements were specified in ERCB Informational Letter 89-4 and were reinforced in EUB Guide 56, "Energy Development Application Guide and Schedules".

The EUB expects oil and gas industry applicants to communicate and consult with those members of the public who may be affected by the proposed project in all situations with the intent of avoiding conflict. Frequently, such communication results in resolution of concerns. When conflicts are not resolved, however, outstanding issues may be addressed in a public hearing before the EUB. It should be noted that the EUB does not regulate the quality of communication between industry and the public but encourages industry to develop and maintain comprehensive public consultation and communication practices. To this end CAPP is currently preparing a document to be titled "Public Involvement Guidebook", to be issued in the first quarter of 1997. This is intended as a manual to assist companies in the initial stages of setting up a public communications process.

Effective industry/community dialogues have been organized in several regions of Alberta with the establishment of area operators groups. These public forums allow industry to update residents on development plans for the area, as well as to hear the residents' views of industry's existing and planned activities.

Most EUB statistical information on solution gas flaring is publicly available. While much of the information is not routinely prepared for public users the EUB has attempted to collate and disseminate the data when requested, subject to the constraints imposed by the information system needed to gather, retain, and distribute large amounts of information.

8.3 Review Team's Views

The Review Team believes that existing notification, consultation and communication requirements and guidelines should be viewed as minimum expectations. The Review Team's community consultations clearly indicated dissatisfaction with the availability of information about solution gas flaring policy, industry practices and the environmental and health impacts from flaring and emissions.

A key aspect of the input from EUB customers in the consultation process was the need to build trust and cooperation between the public, industry, and regulators in resolving flaring issues. Evaluations also showed strong support for the use of the customer consultation process as a way of obtaining input and advice on solution gas flaring issues.

The Review Team therefore believes that both the industry and regulators should continue to look for ways of improving the public's level of trust through honest, open and proactive communications. This would include members of the public assuming some responsibility by participating in communication processes and by notifying industry and regulators when they have concerns or complaints about solution gas flaring.

In the immediate future, communication issues should be dealt with in the following two ways:

- *continue to engage in an active exchange of ideas and views during the review of proposed regulatory changes affecting solution gas flaring. Ensure that the proposed regulatory response is one that reflects the broadest possible consensus.*

- *ensure that existing information about solution gas flaring is prepared such that non-technical audiences can easily access and understand it.*

As part of the implementation of regulatory change, a directed communication plan should be jointly developed by regulators and industry to ensure that the nature and effect of the changes are fully communicated to the appropriate audiences.

In the longer term, communication should focus on the effectiveness of regulatory and industry-initiated response in reducing the known and possible impacts of solution gas flaring. In addition to tracking effectiveness, the quality of communication, as indicated by perceptions of overall trust levels, should also be monitored.

9. Regulatory Efficiency

9.1 Participants' Views

Several, from both the community and industry sides, thought that the regulation of solution gas flaring lacks a well-defined and understandable policy basis. It was not clear to these people how decisions to flare or conserve solution gas are made. On the other hand, it was generally acknowledged that an approach of "one rule fits all" may be impractical, and that unique solutions may be necessary to address site-specific issues.

Some of the representatives for environmentalist groups pointed to the absence of guidelines for many compounds emitted by flares, and the need for a process to determine acceptable standards for emissions of these compounds. As well, there was concern expressed about the tendency to exempt (or "grandfather") existing facilities when new regulations are introduced.

There was some concern about an apparent diminishing role of the EUB in its move to encourage industry "self-regulation", and the implications this might have for fair and consistent enforcement. Along the same lines, some industry representatives expressed the need for more consistency among the regulators (e.g. EUB, AEP), especially in the interpretation of approvals and licences, and regulations relating to environmental matters. Also, there should be clearly-defined areas of jurisdiction and elimination of overlap between government agencies.

9.2 Current Regulatory Process

With respect to the matter of "self-regulation", a much better terminology is "self-assessment". It is the EUB's intention to promote a greater degree of industry accountability — not less — by ensuring that industry is aware of, accepts, and undertakes to meet Alberta's requirements. A related obligation is for the EUB to spell out in clear terms its expectations and the consequences if they are not met. To characterize the EUB's objective as encouraging a system of self-regulation is an unfortunate and inaccurate choice of terms.

The EUB has found that some companies may not be aware of requirements, or they may not accept their validity. Neither of these conditions is acceptable. It is the EUB's goal to achieve a more knowledgeable, responsive and accountable industry performance. One of the vehicles to achieve this is likely to be tougher penalties for non-compliance, however, there will be other methods employed as well. Industry accountability demands that industry understands and operates according to regulatory goals which is, in the EUB's view, substantially different from a concept of self-regulation.

One of the aims of this report has been to document the current regulatory processes, both to enlighten those who may be unfamiliar with the EUB's philosophies, underlying principles, and constraints, as well as to provide a basis for recommending change where change appears warranted. Many of the concerns listed above have been addressed in other parts of this report but, a summary of some of the more important points might be appropriate.

It is the EUB's intention that the implementation of regulations be based on a consistent approach to problem identification and resolution. With respect to conservation of resources, this implies an economic test to ensure a prudent balance between the cost of conserving solution gas and the value of the gas to potential customers. Although economic parameters change — sometimes quite dramatically over the course of a year — the EUB believes that a longer term perspective contributes to objective and consistent implementation of its policies.

The EUB's area of responsibility for Alberta's environmental protection presents a much more complex set of issues. The number of variables are considerably larger than for a cash flow analysis. As well, identifying and quantifying the relationships between industrial activity and environmental impacts is a difficult process. With the variation in circumstances across different regions, the EUB fully concurs with the view, expressed during the focus groups, that one rule is not likely to fit all situations. Reasonable implementation of the EUB's policies requires sufficient flexibility to adapt to differing local conditions and needs.

When the EUB introduces new regulations it considers very carefully the implications of extending such regulations to existing facilities. The EUB has never declined to intervene in any industry activity or practice when continuing the activity posed a threat to the public interest, and this philosophy applies equally to the extension of new regulations to existing facilities. New regulations or expectations do not necessarily mean that the previous standards offered

inadequate protection at the time. Often, introducing new regulations merely acknowledges that technology has evolved to a point where industry should be upgrading its standards, given the uncertainties associated with potential environmental impacts, and even in some cases where such impacts are currently believed to be small. An example of this approach was discussed in a joint Information Letter issued by the EUB and AEP in 1988, in the consideration of sulphur recovery for gas plants with sulphur inlet rates of less than 10 tonnes per day.[7] In that report the EUB and AE concluded:

> "While environment and health-effect studies do not identify these plants to be a problem, they are often viewed with open hostility by local residents and with each new application, the degree of public opposition is increasing, resulting in delays and significant costs to both government and industry. Given the geology of the province and assuming reasonable gas marketing prospects, one can expect to see an increasing number of new small sour gas plants. Also, although sulphur emissions from small plants currently do not represent a significant portion of total emissions in the province, an increasing number of these small plants without some level of sulphur recovery could result in their representing an increasing portion of the total. AE and the ERCB therefore believe that some degree of sulphur recovery should be required for these plants in order to help allay concerns of the public."

While the EUB believed that the costs of introducing this new regulation were justifiable for new facilities, where modifications could be incorporated in a project's engineering and design from the start, the EUB believed that the extra costs that would be required for retrofitting older facilities would not be justified by the perceived benefits. Had the pre-existing regulation been inadequate in protecting the public, the EUB would not have hesitated to extend the new guidelines to older facilities.

9.3 Review Team's Views

The Review Team appreciates that sometimes there appear to be different standards in different regions of the province. Most often, however, these differences are for legitimate reasons and can be explained by regional differences in the volume of flaring, the differing compositions of the solution gas streams across different regions, and proximity of flaring facilities to residences or communities. The Review Team believes that the regulatory system needs some latitude for exercising reasonable judgement in differing situations, and that a one-rule-fits-all approach would be more bureaucratic than necessary.

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[7] See Information Letter (IL) ERCB-AE 88-AA, "Sulphur Recovery Guidelines for Sour Gas Plants in Alberta".

On the other hand, the EUB's intentions are subject to different interpretations and the Review Team believes this has sometimes resulted in their uneven application. Often, regional standards evolve out of the following series of questions:

1. "Are there reasonable alternatives to flaring?"

2. "What, if any, problems are caused by flaring within this region?"

3. "Which of those problems fall within the EUB's mandate?"

4. "What is the most effective means of dealing with the problems?"

Specific regional conditions might indicate that flaring ought to be contained, reduced or even virtually eliminated in some regions, however, such a conclusion ought to be reasonably explainable and should be the logical result of a thoughtful review process.

The Review Team believes it is reasonable to expect that, as circumstances vary from one region to another across the province, standards for industry performance could also differ, depending on local conditions. However, in determining the optimal performance standards within each region, the same questions should be posed and a similar line of reasoning should be applied by those delegated to implement the EUB's policies.

Appendix A

The Costs of Further Solution Gas Conservation in Alberta

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The Costs of Further Solution Gas Conservation in Alberta

Currently there are about 10 500 oil batteries operating in Alberta. Virtually all of them produce some amount of solution gas and 6700 have enough to warrant the installation of equipment to collect, process, and market it. About 3800 flare the solution gas in volumes and numbers as shown in Table A-1. As shown, the total volume of raw solution gas flared in this manner averaged some 173 million cubic feet per day (MMcf/d) over the period January to September 1996.

It is tempting to make a few simplifying assumptions — for instance, a 40 per cent shrinkage factor to convert raw solution gas to processed (marketable) gas — and apply something like an average price of, say, $2.00 per thousand cubic feet (Mcf), and conclude that the value of gas being flared might be in the neighbourhood of $260 000 per day, or $75 million per year. This, however, would be too cursory an analysis from which to draw any useful conclusions. Although simplifying assumptions are certainly necessary they should bear some — even if only vague — resemblance to the real world. Following is the Review Team's attempt to put this in a perspective.

The first thing to note is that solution gas does not emerge from the well bore in a marketable form; it must be processed to remove impurities, which average about 40 per cent of its raw volume. This is referred to as the "shrinkage component". Another major cost item is for compression. Solution gas, at about 50 pounds per square inch (psi), must be compressed to between 950 psi and 1400 psi (depending on the location of the battery in Alberta) to access any of the gas distribution systems such as Nova, Northwestern Utilities, or Canadian Western Natural Gas. The other major cost category is for transmission, first to get the gas from the batteries to a processing facility, and then from the processing plant to a trunk line. There are any number of hardware configurations and methods of cost allocation that could theoretically be applied to the batteries in Table A-1, and while the Review Team took considerable liberties to simplify the process it is believed that, overall, the cost estimates are likely to be conservative.

The smallest scale of gas plant operated in Alberta has an inlet capacity of about 1 000 Mcf, which is the approximate scale required for the volumes flared at an average battery in group 1 in Table A-1. This would be a skid mounted, modular facility that would cost about $2.5 million, including some compression capability but exclusive of a building to house it, site preparation, and other related costs. For simplicity the Review Team assumed that 23 such modules would be adequate for processing the volumes in group 1 for a total cost of about $58 million. The batteries in group 1 are also located in northern Alberta and are, on average, 50 miles from the nearest tie-in point of a Nova transmission line. Because of rough terrain and multiple river crossings, pipeline construction would be more difficult than in southern Alberta and could cost in the order of $100 000 per mile for a 2 inch pipeline which, for 23 batteries at an average distance of 50 miles, would add up to some $115 million. Although the capital cost of the processing module provides for minimum compression requirements this would not be adequate, considering the distances involved and the location of the batteries in northern Alberta. Therefore, extra

compression capability would be required at a cost of some $700 000 per battery, totalling to $16 million. With this, the capital costs alone of tieing-in the 25 largest flaring batteries, shown as group 1 in Table A-1, could be in the order of $200 million. Operating costs would be in the neighbourhood of 10 per cent of capital costs, or about $20 million per year. With a shrinkage factor of 40 per cent and a market value of $2.00 per Mcf as suggested above, the market value of the gas flared by the group 1 batteries would be about $10 million per year, for perhaps 2 or 3 years, when production would likely begin to decline at a rate between 15 and 25 per cent per year. In view of the costs involved and the very marginal value of the additional gas that would be produced the Review Team could not advocate conserving these volumes of gas on the grounds that flaring constitutes a waste of a valuable resource. Rather, requiring it to be tied-in for conservation reasons would imply a much more serious waste of many other resources.

The batteries in group 2 of Table A-1 each flare an average of about 200 Mcf per day. Realistically these would have to be situated in clusters of at least 4, and would have to be reasonably close to a main gas transmission line, for the operators to approach a break-even financial point. (It is these batteries, along with those in group 1, that Board staff pay particular attention to in the course of enforcing the Board's conservation mandate.) Unfortunately, the 374 batteries remaining in this group are scattered too widely to be able to benefit from a combined effort to conserve. However, assuming the issue were forced for reasons other than for the conservation of resources, the Review Team offers the following as a plausible cost estimate for tieing-in these batteries.

Assuming that the skid-mounted modules used to process the flared volumes in group 1 could be scaled down to handle inlet rates of 200 Mcf per day (which possibility has not been demonstrated), and at a capital cost of, perhaps, $1 million each, processing capacity for all of the group 2 batteries would cost $374 million. To move the discussion along the Review Team also assumed that the average distance to the nearest Nova tie-in point would be no more than 2 miles and that the low-end pipeline construction costs would apply, for $40 000 per mile. Thus, pipeline costs would add up to about $30 million. Assuming that no additional compression costs would be required, the total capital costs of conserving the gas flared by the group 2 batteries would be about $400 million. Operating costs would be expected to come in at around $40 million per year. The conserved gas would have a market value of some $32 million per year for as long as production remains constant - usually no more than three years - after which revenues would drop by 15 to 25 per cent per year. Again, the Review Team could not advocate such an undertaking for reasons of resource conservation.

Admittedly the scenarios described above are speculative, however, the Review Team believes that the underlying assumptions are credible enough to indicate the substantial costs that would be imposed to conserve, what amounts to, a product of marginal value. The Review Team declined to estimate the economic implications of conserving gas flared by the batteries in group 3 because the costs escalated at such a rate, relative to the value of the conserved solution gas, that the results quickly lost any useful sense of proportion.

Appendix B

Sample Information Package Circulated to Focus Groups

June 7, 1996

The enclosed package of information is intended to assist your participation in the focus group session scheduled for 10:00 a.m. 25 June in Hardisty at the Hardisty Community Hall. For the most part, the information relates to statistical data for the province as a whole, and for your region of Alberta specifically (marked as Area 2 on the accompanying map). You will note that there are other regions of the province that have been highlighted on the map, which shows the areas where we will run focus groups similar to the one you have volunteered to attend. These meetings are intended to provide us with:

- the range of issues that participants believe need to be addressed with respect to solution gas flaring and emissions,
- a ranking of the issues in order of priority,
- an appreciation for the types of tradeoffs that would be acceptable for a given change in regulatory approach, and
- a sense for those areas where the Board could improve the way it regulates flaring and emissions, and how it might go about changing the way it does things.

Following these sessions the views of all the participants will be considered in a report prepared by Board staff. We will attempt to respond to all of the issues that emerge from the focus groups. For those matters that are the direct and sole jurisdiction of the AEUB we expect that we will be in a position to respond with an explanation of the Board's policies or specific recommendations for change, perhaps both.

Some issues may be shared responsibilities between the AEUB and other government departments or, indeed, may be beyond the Board's jurisdiction entirely. While we cannot promise closure on these issues, we will ensure that the appropriate decision-making authorities are apprised of the views expressed during these focus groups.

If you have any questions or comments on this initiative please feel free to contact me at 297-8578. In the meantime I look forward to hearing your views during the focus group session.

Yours truly,

Kevin Johnston
Senior Economist

OIL & GAS ACTIVITY FACT SHEET
WAINWRIGHT: TWP 31to 41 RNG 1 to 16 W4M
(Area 2 on the attached map)

Operators

- There are 165 operators in the area.
- There are 5 operators operating between 100 and 200 wells.
- There are 9 operators operating between 50 and 100 wells.
- There are 39 operators operating between 10 and 50 wells.
- There are 102 operators operating fewer than 10 wells.

The Top 10 Operators are:

Operator	Number of Wells Operated by Each
Renaissance	1515
PanCanadian	668
Fletcher Petroleum	544
Petro-Canada	502
Norcen Inter	354
Pinnacle Resources	268
Chauvco	251
Petro Rep Resources	230
Morrison Petroleum	221

Production

- There are a total of 7307 wells currently on production. The historical trend of the number of wells is shown on the accompanying graph.
- The H_2S content in the solution gas varies significantly from trace amounts to as high as a 10% concentration of H_2S in the gas. Most of the gas however, contains less than 5% H_2S.
- The volume of oil produced in January 1996 was 680 10^3 m^3.
- The volume of gas produced in January 1996 was 416 10^6 m^3.

Recent & New Events

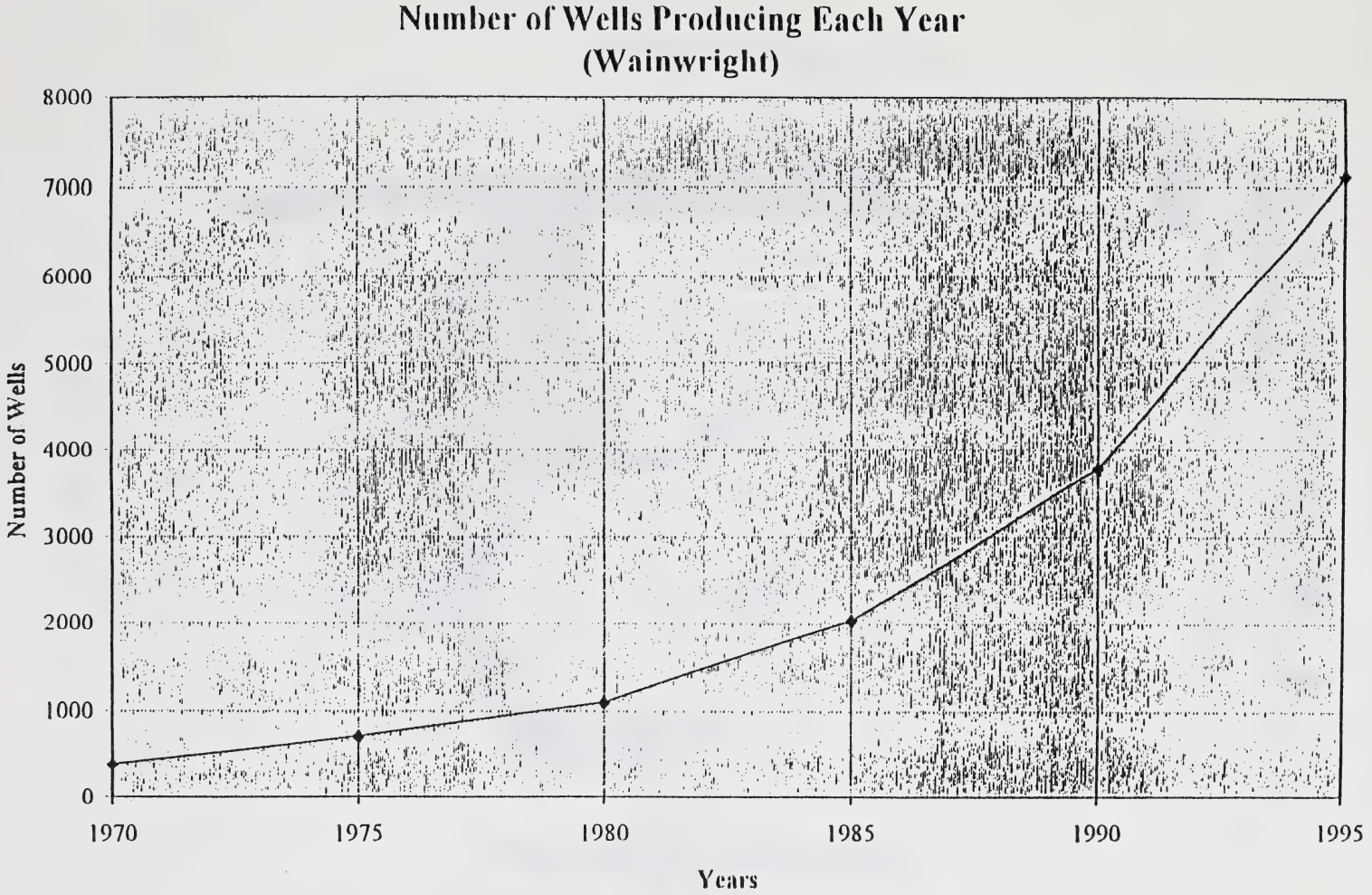
- Fletcher Challenge Petroleum Inc. (FCPI), has been given approval to increase the licensed raw gas throughput of its sour gas processing plant in Provost (location: 2-10-39-10 W4M) with the installation of additional compression.

This will result in the following changes to the inlet and recovery streams of the facility:

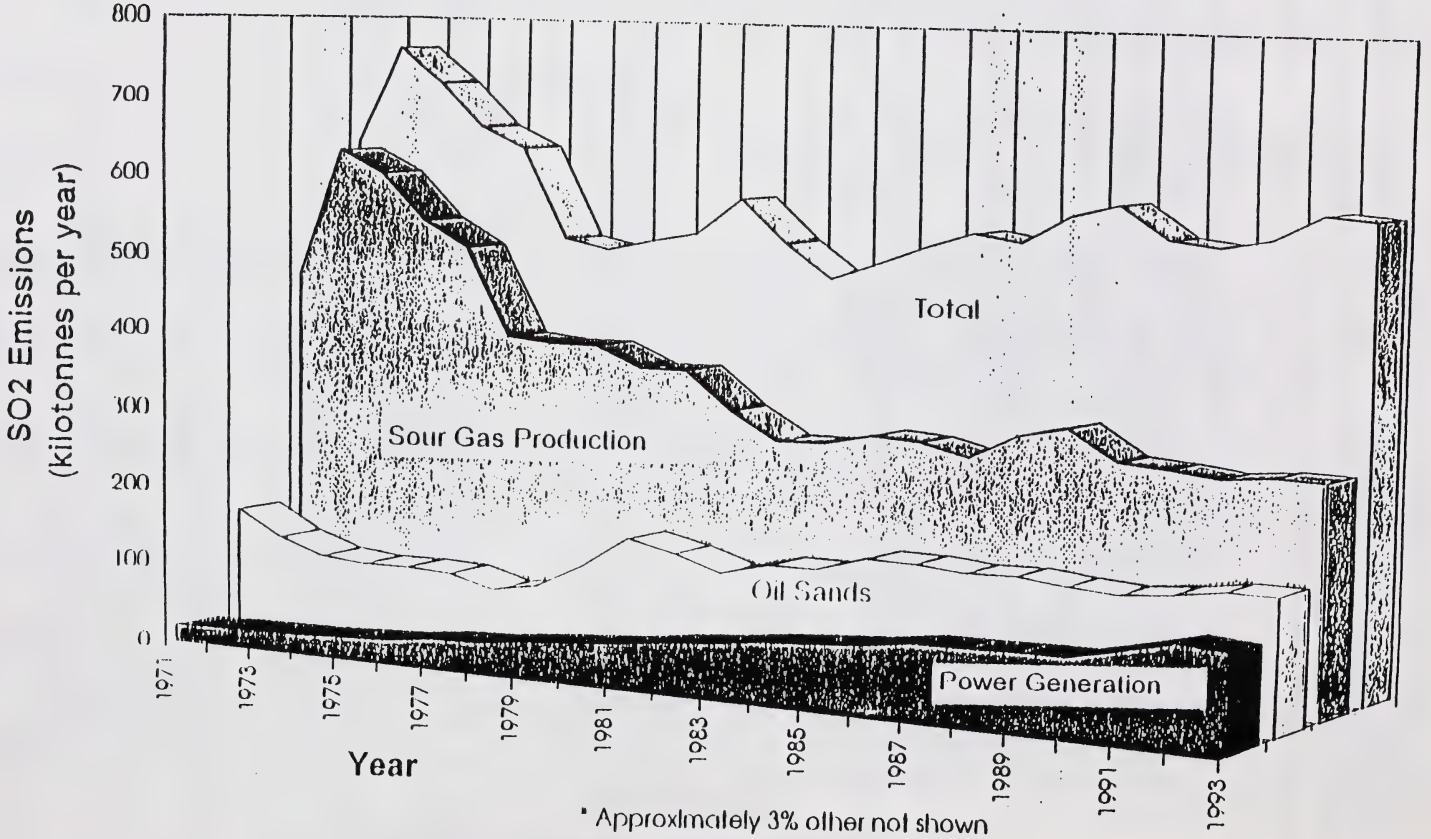
	Current	**Proposed**
Raw gas ($10^3m^3/d$)	169	226
Sales gas ($10^3m^3/d$)	166	222
Sulphur emissions (t/d)	0.7	0.95

Solution gas that is currently being flared in the area will be tied in with its new approval, thus providing several benefits to the community: well site flaring will be consolidated in one location; previous occurrences of black smoke emissions will end as the low pressure flare stack will no longer be needed; and a vapour recovery unit will be installed to recover sour gas tank vapours which were previously flared.

- Recently five wells have been tied into the facility.
- FCPI will be tying in three wells this spring.
- FCPI has been discussing with Pinnacle Resources the tying in of eight wells.
- FCPI is also looking at the economics of tying in 4 wells in Sections 28 and 29-38-10W4M which have recently been acquired from Rennaisance Energy.
- FCPI is also proceeding with a scheme to use its currently flared solution gas at its
- 12-21-35-6W4M Consort battery to generate power for its own use at this site. The scheme is projected to start up by 1 October 1996.

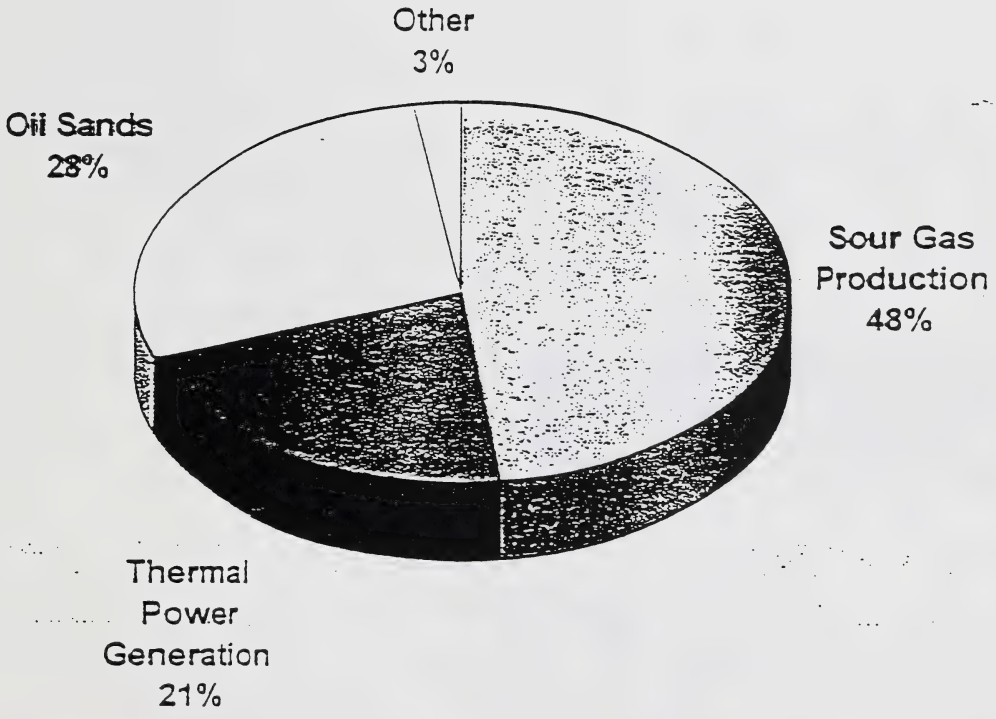

Number of Wells Producing Each Year
(Wainwright)
8000
7000
6000
5000
4000
3000
2000
1000
0
Number of Wells
1970
1975
1980
1985
1990
1995
Years

Alberta SO2 Emissions
Industrial Sources *

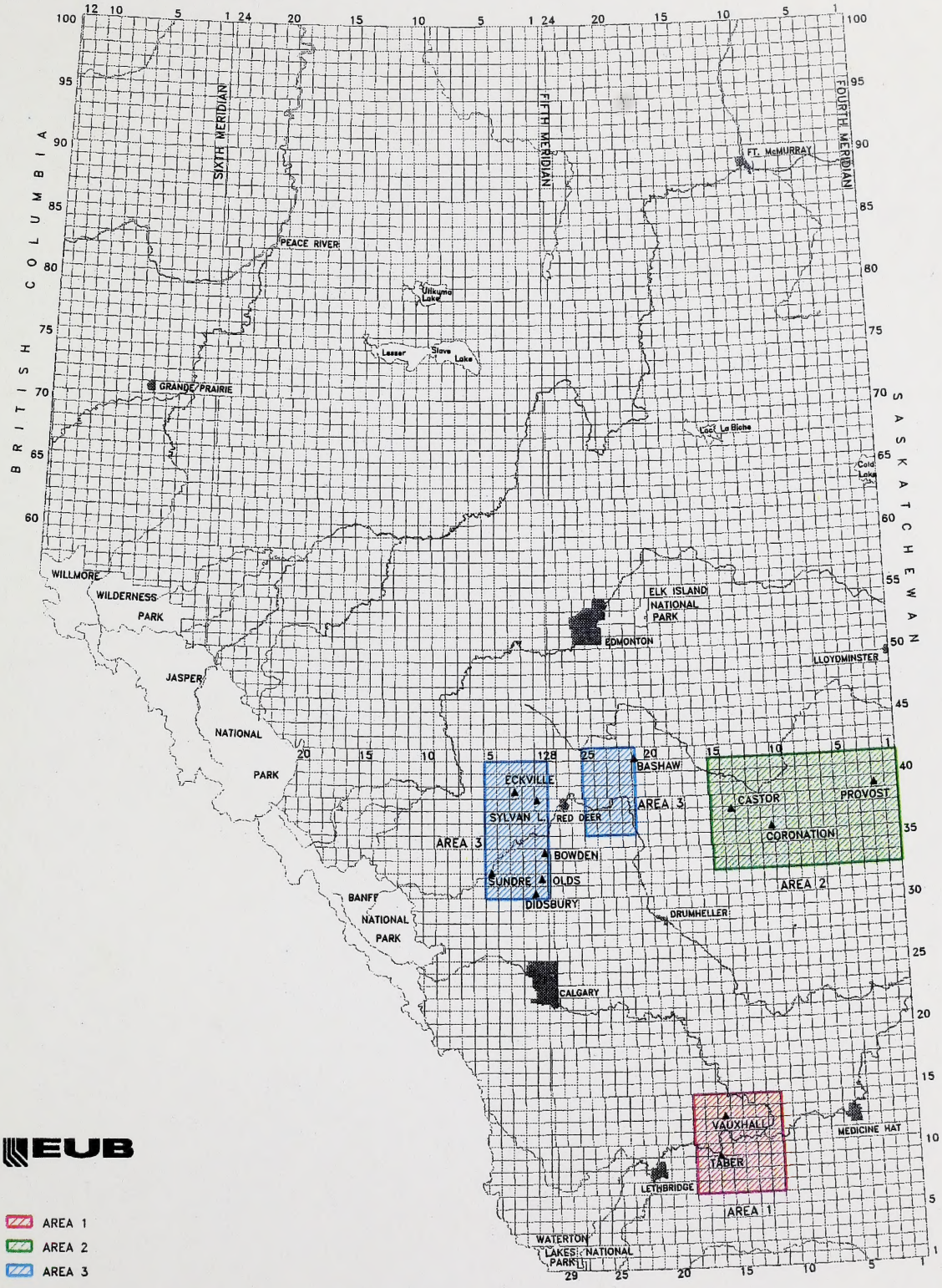


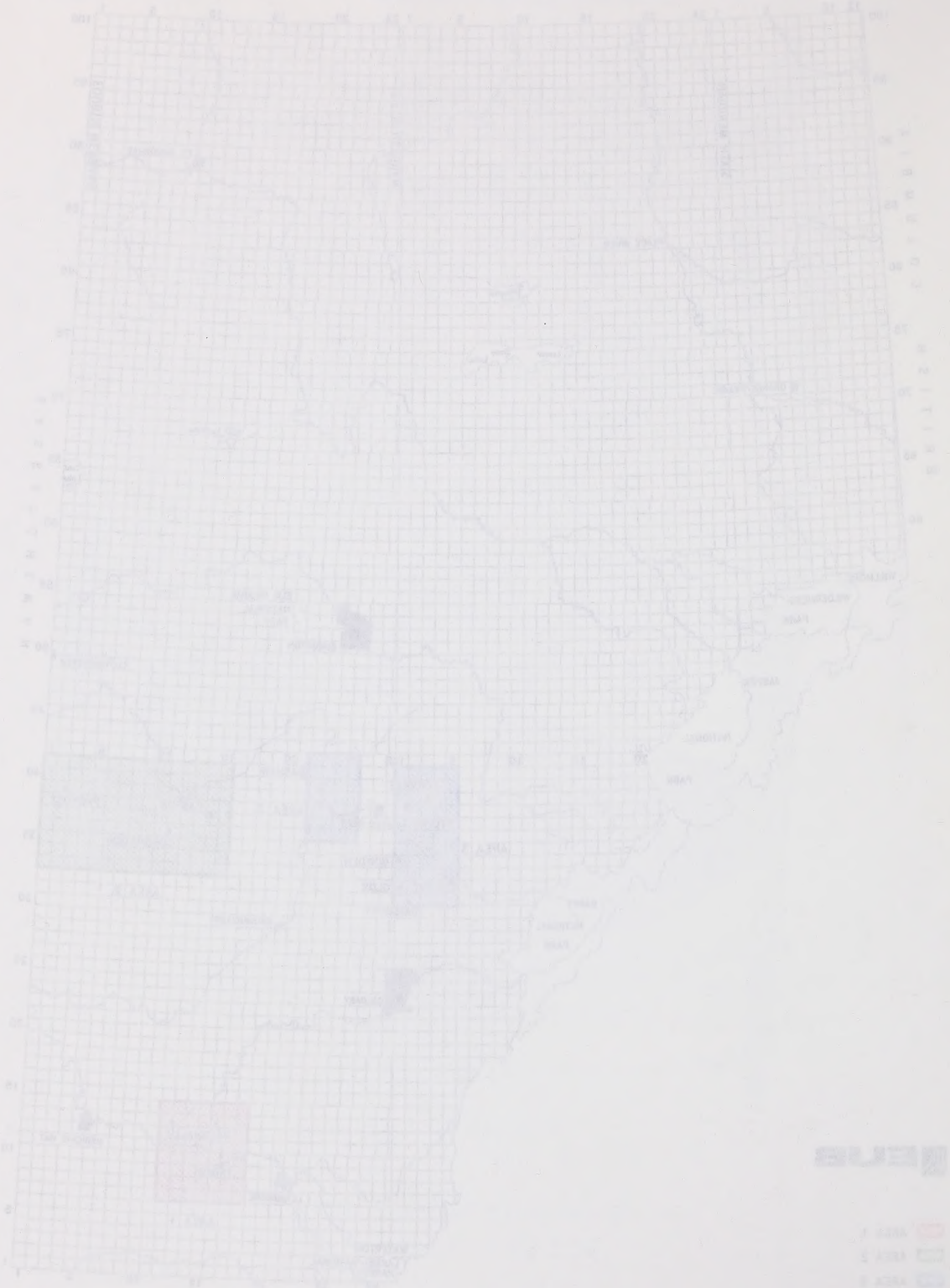
Alberta SO2 Emissions
Industrial Sources *

(600 kt SO2/yr)



* 1993 data (except for 1992 Other)


EUB
AREA 1
AREA 2
AREA 3
BRITISH COLUMBIA
SASKATCHEWAN
SIXTH MERIDIAN
FIFTH MERIDIAN
FOURTH MERIDIAN
PEACE RIVER
GRANDE PRAIRIE
Ulikumi Lake
Lesser Slave Lake
FT. McMURRAY
Lac La Biche
Cold Lake
WILLMORE WILDERNESS PARK
JASPER NATIONAL PARK
BANFF NATIONAL PARK
ELK ISLAND NATIONAL PARK
EDMONTON
LLOYDMINSTER
ECKVILLE
SYLVAN L.
RED DEER
BASHAW
AREA 3
BOWDEN
SUNDRE
OLDS
DIDSBURY
DRUMHELLER
CASTOR
PROVOST
CORONATION
AREA 2
CALGARY
VAUXHALL
TABER
LETHBRIDGE
MEDICINE HAT
AREA 1
WATERTON LAKES NATIONAL PARK



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